

TIME AT SEA AND THE ASTRONOMICAL DAY.

IN spite of the stress of war, the British, French, and Italian Admiralties found opportunity last year to come to an important decision on the question of timekeeping at sea. Hitherto the general practice appears to have been to set the ship's clocks to the local time corresponding with the place where observations were made, and continue its use until further observations were secured. In consequence, two vessels speaking each other might record different times for their meeting; cases are not unknown where it has been of legal importance to ascertain the exact time of a death occurring at sea, which was a matter of some difficulty on the old system. It has now been resolved to extend to the sea the

of chronometer dial to facilitate the determination of the ship's time; he describes and illustrates it in *La Nature* for March 2 (see Fig. 1). There are three hands, indicating day of month, Greenwich hour, and minute respectively. Apart from the month hand, which is of the nature of a luxury, the new form of dial could be readily adopted for all chronometers. It has five concentric circles of graduation: first, the degrees of longitude, counted from 0° to 180° in each direction; second, the hours to be added or subtracted; third, the graduations of the minutes of time; fourth, the Greenwich hours, reckoned from oh. (midnight) to 23h.; fifth, the days of the month; inside these the compass points are indicated, but they can be omitted if desired.

The discussion on time at sea has incidentally reopened a larger question, which was mooted some thirty years ago, but shelved for a time. This is whether the use of the astronomical day, commencing at noon, might not be discontinued, and the civil day, commencing at midnight, extended to astronomy. This matter has been under informal discussion for several months, and in the opinion of the present writer the general feeling is in favour of the change, though there are some names of great weight on the other side. The astronomical day goes back at least to the time of Ptolemy; it is based on the obvious principle that the bulk of observational work is done at night, so that the night should be kept as an unbroken unit. But this point is not gained without appreciable inconveniences; most astronomers must have felt a considerable amount of mental worry in having a different calendar date for all occurrences between midnight and noon, according as we are considering their astronomical or their civil aspect; even the month or year is sometimes affected. There is, moreover, some confusion as to whether the astronomical day begins with mean or apparent noon; the Nautical Almanac uses both systems in different sections, so that several minutes each day form a sort

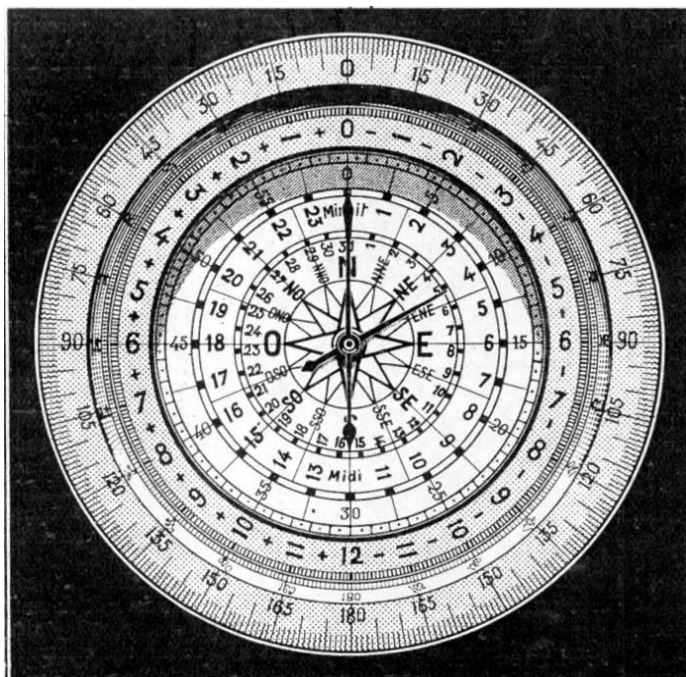


FIG. 1.—P. Vincent's design for chronometer dials.

system which has been so widely adopted on land, of keeping time which differs by an integral number of hours from Greenwich time, the hour being changed on crossing meridians 15° apart. In this connection it may be noted that there is need of a short name for the regions that keep the same time. The word "zone" is to be deprecated, since both by root-meaning and by usage it suggests a belt parallel to the equator. The word "lune" has been adopted in works on spherical trigonometry, but is apt to suggest a connection with the moon. The French use the somewhat cumbersome term "fuseau horaire." Mr. T. C. Hudson suggests the term "douve"; it means a barrel-stave, which has some resemblance to the shape of the regions in question.

Commandant P. Vincent has devised a new form

of No-man's-land, being claimed for different dates on different pages of the almanac; there would be no similar confusion at midnight, apparent midnight being a meaningless phrase.

Both the British and French Admiralties are agreed that the use of the civil day would be a convenience to navigators. The French have already decided to adopt the civil day in their abridged Seamen's Almanac from the year 1920. A few British astronomers have suggested that our abridged almanac should be changed, but not the larger one. This would lead to great risk of error, since the larger almanac is often used at sea; the sailor has a claim to consideration before the professional astronomer, since the latter has more leisure to make his calculations, and errors, if made, are less disastrous.

In response to an appeal from the Admiralty, the Royal Astronomical Society is now sending round a circular to representative astronomers and societies in our own, the Allied, and neutral countries. This, after a brief *résumé* of the circumstances, enumerates the changes in the almanac that would be involved if the new system were adopted, and invites suggestions and criticism. It is thought that 1925 is the earliest date that is practicable for making the change, since the almanac goes to press several years in advance. It is proposed that the reckoning by Julian days shall still begin at Greenwich noon, in consequence of the numerous ephemerides of variable stars that have been drawn up on this system; this would afford a means of relief to those astronomers who dislike the change; by dating their observations in Julian days, instead of calendar dates, they could continue to keep their nights undivided.

It is hoped that the change, if made will be adopted throughout the astronomical world, so that an interval is wisely being left for full ventilation of the subject. Some have hopes that the change might be accompanied by the introduction of twenty-four-hour reckoning by the general public; this system has long been in use in Italy, and leads to a great simplification of time-tables of railways, tides, etc. It does not necessarily involve the use of new clocks with twenty-four-hour dials. It suffices to use the present dials, merely inserting 13h. to oh. inside the figures 1h. to 12h. In fact, many prefer this system since the hours on a twenty-four-hour dial are inconveniently close.

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THE RECOVERY OF POTASH FROM BLAST-FURNACE GASES

THE sources of potash were described by Sir Edward Thorpe in an article in *NATURE* of January 3 (p. 344). One of these sources has been the subject of study by Prof. R. A. Berry and Mr. D. W. McArthur, who have published the results of their investigations in a paper read before, and discussed at, a meeting of the West of Scotland Iron and Steel Institute. These investigators have studied in particular the possibilities of recovering potash from the blast-furnace gases obtained in Scottish practice, with the view of obtaining information as to how far these may be expected to constitute an economic source of supply, when the restrictions imposed by the war no longer hold.

That the dust deposited from blast-furnace and kiln gases contains potash salts has long been known, and in 1884 Barclay and Simpson, of the Harrington Ironworks, Cumberland, took out a patent for the recovery of salts, and especially potash salts, from coke-fed furnaces. The most considerable investigation, however, on this subject is that by Wysor, of the Bethlehem Steel Company, U.S.A., who found that the dust which collected at the bottom of the stone chequer-work in the stoves and gas-fired boilers contained 15 per cent. of water-soluble potash (K_2O). Fur-

ther, he drew up a balance sheet to show the amount of potash charged into the furnace and the percentage recovered. His conclusion was that the greatest losses occurred in the primary and secondary washers, constituting some 56 per cent. of the whole, while 20 per cent. was carried off in the slag; further, that less than 1 per cent. of the potash charged was recovered in the dust alluded to. In 1916 a Cottrell plant for electrostatic precipitation was installed, and it was found that practically all the dust could be precipitated. About 22.4 lb. of potash were charged per ton of pig-iron produced, and after deducting the amount contained in the slag and the dust-catcher, about 15 lb. per ton of pig-iron appeared to be left in the gases, which were then recoverable in the Cottrell plant.

The average potash content of the American ores is about 1 per cent., and as the production of iron in the United States in 1916 was nearly forty million tons, if Wysor's figures are correct the flue-dust from the furnaces should constitute a very considerable source of supply.

As the authors point out, the problem in Scotland is different: first, because coal, and not coke, is the fuel generally used, and secondly, because the ores contain rather less potash. With coke-fired furnaces the gases are not washed, but are led from the catchers direct to the stoves and boilers. In coal-fired furnaces, however, a considerable amount of tarry matter is produced, whereas the dust deposited is relatively very small. The problem of recovery is therefore different. The potassium is present in the ore, principally, no doubt, in the form of silicate. This reacts at the high temperature of the furnace and forms other compounds, for, as the dust analyses show, chlorides, sulphates, and carbonates were the principal acid radicals present. It is well known, further, that potassium cyanide is formed in certain regions of the furnace, but decomposed in others. At the high temperature these potassium salts are vaporised; they condense in the cooler parts of the furnace as fine dust particles, and are carried along with the dust from the fuel and the ores. The first particles deposited are the heaviest, and these are caught in the dust-catcher, in the form of a coarse, black powder; deposition also occurs on the main tube, and these two constitute the tube cleanings. The heavy, tarry matter separates principally in the condensers and carries with it much of the fine dust; the gas then passes to the water scrubbers, which retain the rest of the tarry matter and most of the remaining dust. Any mineral matter still retained is caught in the stove and boilers.

The authors have received and analysed samples of these deposits and liquors from various plants in Scotland, and have determined their potash content. Nine samples of flue-dusts were examined: eight from coal-fired furnaces and one from a coke-fired furnace. The highest yield of dust in the former was only at the rate of 21 tons per annum, as against 300 tons for the latter; and the water-soluble potash averaged 8.86 per cent. The percentage of ash in the tube cleanings varied